Frequently Used New Uses Terminology

Bioeconomy: An amorphous term. For NCGA purposes, the bio-economy is the direct (e.g., an ethanol plant) and indirect (e.g., some portion of the revenue of a restaurant near the ethanol plant) economic activity enabled by industrial biotechnology.

Biobased Materials: A material containing renewable carbon as analyzed by ASTM D6866. ASTM D6866 measures the amount of "new" carbon by measuring the amount of the Carbon-14 isotope present in samples. This process can determine the levels of fossil-derived and new carbon in samples.

Biodegradable: Materials that will be reduced into basic elements—usually water and carbon dioxide—by environmental processes mediated by microorganisms. Most carbon-based materials are biodegradable, but timing is an important consideration.

Biorenewable: A more general term than biobased, which includes not only those materials made with chemicals derived from renewable materials but also those directly incorporating renewable materials—for example, a paper cup or car door panel with fibers from plants as reinforcement.

Compostable: Materials that can be biodegraded relatively quickly. Some materials can be composted in residential situations; others need commercial composting facilities. All compostable things are biodegradable, but not all biodegradable things are compostable. For example, in the right conditions, a bone, will degrade over time, but the timing is such that it is not compostable.

Industrial Compostable: Materials that can be composted but require special conditions--usually elevated temperatures-- to completely degrade.

Bioplastic: A plastic made with renewable carbon. This may be a uniquely bioderived material such as furan dicarboxylic acid or 1,3-Propanediol (FDCA) or biobased substitutes for existing petroleum-derived plastics such as polyethylene.

Biopreferred®: A USDA program that encourages government agencies to purchase biobased materials when they are equivalent and priced similarly to petroleum-based products. Very important program to create a market for bioderived products.

Industrial Biotech: Biotechnology focused on new industrial products and processes. Products are diverse and include fuels, industrial materials, chemicals and solvents, feed and food. This segment of biotech is different from health (e.g., pharmaceuticals), agricultural (e.g., GM plants) or environmental (e.g., bioremediation) biotechnology.

LCA (Life Cycle Analysis): A method to calculate the total environmental impact of a product from the production of the raw materials that the product contains to the disposal or recycle of the product.

Sugar: General term for small carbohydrates. Examples include arabinose, glucose, fructose, maltose and sucrose (table sugar) and many others.

Glucose: (also known as dextrose) A simple sugar that is used as a feed for many fermentations. It can be derived from starch—a polymer of glucose—by the action of amylase—an enzyme.

Cellulose: The structural material of plants. Made up of glucose but in a highly structured, crystalized form which is difficult to break down.

Fermentation: A process by which materials are converted from feedstocks to a product by micro-organisms. A good example is the production of ethanol from sugar.

Fractionation: The separation of materials into subcomponents. Specifically for corn, the separation of whole corn into various fractions of oil, protein, starch and fiber. New technologies in this space are enabling diversification of biorefinery products and feed products.

CRISPER/CAS-9: A genetic engineering system that allows very precise gene modifications. For an analogy, CRISPER/CAS-9 is the genetic equivalent of changing "their" to "there" in a 1000 page book without altering anything else.

Catalyst: A substance that increases the rate of a reaction but is not consumed in the reaction. Platinum in a car's catalytic converter is a catalyst that drives the combination of oxygen and carbon monoxide to create carbon dioxide.

Down Stream Processing: The purification of product from the reaction media. Usually a major cost driver in biotech production

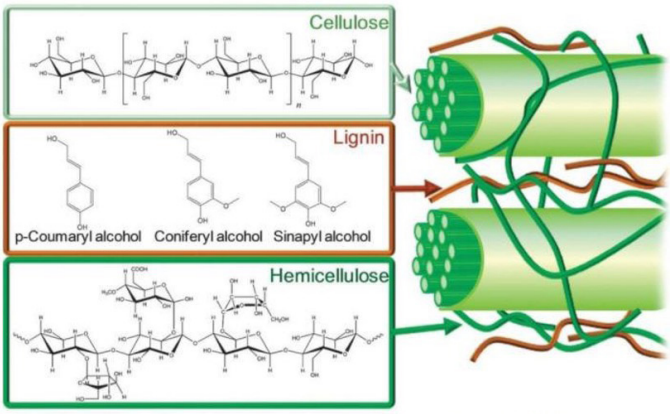
Enzymes: Proteins that can cause reactions to occur. An example is Beano®, alpha-galactosidase which can assist in the digestion of specific food.

Hemicellulose: A combination of sugars (xylose and arabinose) that binds lignin to cellulose

Lignin: Molecular chicken wire. A structural component of lignocellulosic material made of the aromatic alcohols p-coumaryl, coniferyl and sinapyl alcohol.

Lignocellulose: A complex system that plants use for support and protection.

Monomers: A single chemical that can be combined with other chemicals of the same type (homopolymers, e.g., polyethylene) or different types (heteropolymers, e.g., PET for soda bottles) to make long chains of molecules called polymers.



Structure of lignocellulosic biomass with cellulose, hemicellulose, and lignin represented (Alonso et al 2012).

Non-Fuel Products: Products for the bulk fuel market (biodiesel or ethanol) are not subject to the proposed national incentive for biorenewables. A product that can act as fuel additives (anti-knock, lubricity enhancement) that have a value that is 2x or greater than the fuel they are added to, would be approved.

Novel Feed Materials: These are materials where feedstock materials have been converted into a much higher value material. It is not simply fractionation of feed (e.g., soy into a soy protein fractionation).

Novel Food Additives: These are materials that are novel products of fermentation. For example, a fermentation-derived polymer that allows a food matrix to coalesce at high temperatures or a protein that can act as a sweetener.

Polymers: long chains of monomers.

Random Mutagenesis: The process of causing mutations in a genetic sequence randomly. Used as a method to create genetic diversity and often done with ultraviolet radiation or with mutagenic chemicals.

Renewable Carbon: carbon from recently grown plant-based sources.